CHAPTER 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

I. INTRODUCTION

This chapter presents the existing environment of the Firefighter Project area and the potential consequences to that environment that may be caused by implementing any of the alternatives described in Chapter 2. Discussions of current conditions describe the physical, biological, and social environment for each potentially affected resource. Discussions of environmental consequences form the scientific and analytic basis for comparing the alternatives. All direct, indirect, and cumulative effects are disclosed. The means by which potential adverse effects would be reduced or mitigated are described (see also Chapter 2). Some resource conditions consider a larger area than the project area boundary if potential effects extend beyond the project area. Within each resource area section, information on analysis area boundaries used is disclosed.

The discussions of resources and potential effects take advantage of existing information included in the Forest Plan, other project documents, project-specific resource reports and related information, and other sources as indicated. Where applicable, such information is briefly summarized and referenced to minimize duplication. The Project File includes all additional project-specific information, including resource reports and results of field investigations.

Affected Environment/Existing Condition

The resource information provided in the Affected Environment narratives includes the effects of past actions in that they are now assessed as part o the existing condition of the landscape. For instance, consider a hypothetical example of a timber sale in 1980, which harvested 150 acres of forest and constructed 2 miles of new road. The effects of the harvest, road construction, vegetation regrowth, and roadbed stabilization occurring over the past 28 years would be accounted for in several of the resource assessments of the affected environment. A few illustrations of the consideration of past actions in the Affected Environment are provided below.

- The change in forest structure from this past harvest would be displayed in the existing successional stage distribution disclosure in the vegetation section. Field examinations indicate this 150-acre harvest area supports a fully stocked stand of 20-foot tall trees, and has progressed into a mid-seral successional stage over the past 28 years. This information would be included in the acreage of mid-seral successional classification and used in disclosure of existing vegetation and wildlife habitat conditions.
- The existing level of past regeneration harvest in the project area would include the 150 acres from this activity.
- Stream channel surveys assessing stream conditions in the project area would reflect any remaining physical and biological effects of the past timber sale and road construction.

These field classifications of existing conditions of specific streams would be disclosed in the Affected Environment portion of the Fisheries and Hydrology sections of this chapter.

- The present contribution of sediment and increased stream flow from the 2 miles of road construction would also be accounted for in the calculation of existing watershed conditions as specific road segments and their construction dates are entered into the WEPP and WATSED models. Any residual effects from the 150-acre harvest would be reflected in the existing condition model outputs based on vegetative recovery validated trough field and aerial photo analysis.
- Field examinations of road conditions would provide additional data on residual contributions of sediment from the 2 miles of road. These effects would be incorporated into existing road condition disclosures and provide a basis for proposed BMP projects for improved drainage, if needed.
- The 2 miles of open road would also be included in the open and total motorized route densities and reflected in the level of core security habitat presently provided for grizzly bears.

Specific past actions considered in the Affected Environment analysis are summarized in Table 3-1, each resource section in this chapter accounts for these actions. The list of past actions is not necessarily exhaustive, as records may not exist for all past activities by project. This is particularly true for those actions that predated the passage of NEPA in 1970. Nevertheless, the effects of such past actions are fully accounted for in the assessment of Existing Condition as the current conditions assessment necessarily reflects the impact of such actions to the extent that they are still affecting the particular resource considered.

Environmental Consequences

The Environmental Consequences sections discuss in detail the environmental effects that would occur for each alternative. It forms the scientific and analytical basis for the comparison of alternatives presented at the end of Chapter 2 (40 CFR 1502.16). Information used to assess effects is based on the consideration of the best available science. The effects of the No-Action Alternative (Alternative 1) form a baseline against which the Action Alternatives are evaluated. Each narrative begins with a brief explanation of how effects were analyzed and the models used for each resource. When the effects or impacts are associated with an issue, as described in Chapter 2, its relevance and tie to the issue is discussed. This plays an important role in the evaluation of alternatives.

Environmental effects can be direct, indirect, or cumulative; they can be of long or short duration. Effects can be quantitative or qualitative, adverse or beneficial, actual or potential. It is important to consider timing and location of effects. Direct effects are caused by the action and they occur at the same time and place. Indirect effects are caused by the action and are later in time, or further removed in distance, but are still reasonable foreseeable (40 CFR 1508.8). In most cases, direct and indirect effects are discussed together. Cumulative effects are those that result from the incremental impact of the action when added to the other past, present, and reasonable foreseeable future actions (40 CFR 1508. 7). Therefore, the discussion of effects first considers the direct and indirect effects of each alternative and does not consider cumulative effects unless direct and indirect effects exist. As the effects on a resource for each alternative

are read, the supplemental maps should be referred to for the location of activities and/or the area of analysis.

Discussions under each resource include a description of the regulatory framework associated with each resource. Environmental laws such as the National Forest Management Act (NFMA), Endangered Species Act (ESA), Clean Water Act, and Clean Air Act provide the direction to the Forest Service for management of forest resources. These laws are interpreted and defined through the Code of Federal Regulations (CFR), Administrative Rules of Montana (ARM), Land and Resource Management Plan (LRMP) direction, Forest Service Manual (FSM) direction, and Forest Service policy. The regulatory framework associated with each resource is helpful in relating national and Forest direction to resource analysis procedures. The regulatory framework and consistency sections are found at the end of the effects analysis for each resource.

The cumulative effects analysis includes the additive effect of the action being considered when added to the effects of past, present, and reasonably foreseeable future actions. As past actions are already included in the affected environment, the cumulative effects analysis builds upon this existing condition assessment by considering the incremental addition of direct and indirect effects of the proposal as well as present and reasonably foreseeable actions. While impacts can be differentiated by direct, indirect, and cumulative, the concept of cumulative impacts takes into account all disturbances since cumulative impacts result in the compounding of the effects of all actions over time.

The evaluation of direct, indirect, and cumulative effects in the following resource sections used the most recent and available information, as well as data related to past, present, and reasonably foreseeable events that have occurred or may occur in the individual analysis areas. The listed events that are not specifically analyzed or mentioned in the following discussion were considered to have no potential effect on the individual resource. These determinations are documented in the “Cumulative Effects Worksheets” found in each resource section of the project file.

The following table provides a summary of the actions considered in the cumulative effects analysis for the Firefighter Project. Additional information, including maps and specific details (such as the timing, type, location, and the scale of past, present, and future actions), are also included in the Project File. The effects of these activities are discussed by resource area in this chapter.

Table 3-1. Past, Present, and Reasonably Foreseeable Activities in the Firefighter Project Area.

Activity	Past	Present (2008)	Reasonably Foreseeable
Vegetation Management			
Noxious Weed Spraying	Weed spraying has been ongoing, primarily along Forest Road 38, and is expected to continue and expand into the project area (roads primarily) in the foreseeable future.		
Timber Harvest	**Paint Emery Project Decision,** signed 1999, 633 acres harvested, including thinning of trees applied to about 70 acres around Murray Bay Campground, and Riverside and Canyon Creek Boat Landings. **Firefighter Winter Range Project,** 1991-1996, 573 acres harvested, 190 acres had trees/shrubs slashed (no removal of commercial products), and followed by broadcast burning. **Past Harvest Summary – Emery firefighter Grizzly Bear Subunit** 1940-1949 = 163 acres 1950-1959 = 1,203 acres 1960-1969 = 3,454 acres 1970-1979 = 2,316 acres 1980-1989 = 1,680 acres 1990-1999 = 810 acres 2000-present = 119 acres **Total = 9,745 acres** **Past Harvest Summary – Riverside Paint Grizzly Bear Subunit** 1950-1959 = 2,104 acres 1960-1969 = 2,006 acres 1970-1979 = 1,539 acres 1980-1989 = 1,433 acres 1990-1999 = 201 acres 2000-present = 232 acres **Total – 7,515 acres**	All timber harvesting associated with the most recent project decision in the area (Paint Emery and Firefighter Winter Range Projects) have been completed.	
Tree Planting	Approximately 1,300 acres of tree planting within harvested areas has occurred in the project are, beginning in 1960.		Tree planting would occur on approximately 476 acres under the Firefighter Proposed Action.

Activity	Past	Present (2008)	Reasonably Foreseeable
Precommercial (sapling) Thinning	Thinning of young trees has occurred on nearly 5,300 acres since 1964.		Thinning would occur on ~8 acres under the Firefighter Proposed Action. No other sapling thinning is anticipated to occur in the near future (severely limited by adoption of the new lynx habitat management standards).
Prescribed Burning	**Paint Emery Decision:** Prescribed burned ~4.200 acres since 1999. **Firefighter Winter Range Project:** Prescribed burned ~200 acres in the early to mid-1990s.		Approximately 4,400 acres remain to be burned under the Paint Emery Decision
Forest Product Gathering	Personal use firewood cutting, post and pole cutting, Christmas tree harvesting, bough and cone collection, & huckleberry picking.		
Fire/Fuels			
Felix Fire (2007)	875 acres burned in the southern portion of the Paint Emery Project area.		
Recreation			
Public Recreation	Sightseeing, hiking, camping, boating (Hungry Horse Reservoir including Murray Bay, Riverside Bay, and Emery Bay), hunting, biking, cross-country skiing, fishing, snowmobiling (Desert Mountain groomed snowmobile trail), and dispersed recreational activities.		
Roads			
Road Construction and Reconstruction	**Firefighter Winter Range Project:** ~6.9 miles of road construction and ~18 miles of road reconstruction. **Paint Emery Project:** Relocation of Emery Creek Road.		
Road Closures and Reclamation	**Firefighter Winter Range Project:** ~9 miles of yearlong closures. Seasonal road closures include the Firefighter Mountain area roads closed from 10/15-5/15 annually, and the middle portion of Forest Road 896 closed 10/15-7/1 annually. **Paint Emery Project:** ~52 miles of road reclaimed and yearlong closure of Forest Road 896.		**Paint Emery Project:** 64 miles of road reclamation not yet accomplished.
Hungry Horse Dam Construction	Construction of the Hungry Horse Dam, creating the Hungry Horse Reservoir and inundating the South Fork Flathead River, completed in 1953.		

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II. FOREST VEGETATION

Introduction

The following analysis documents the existing conditions and effects of the alternatives on the forest vegetation resource. The issues addressed in this section are: (1) the effects of the proposed activities on forest composition, structure, and age/size classes (including old forest/old-growth, snags, and downed wood), both at the stand and landscape level; and (2) the effect of the proposed project activities on insect, disease, and other mortality factors. Effects to other aspects of the vegetation resource, specifically threatened, endangered and sensitive plants, and noxious weeds, are covered in other sections of this document.

Information Sources

Vegetation data utilized at the stand level includes information from past year's field exams, and those conducted specifically for this project by the District Silviculturist and others in 2007. Summaries and write-ups from these exams are found in the Silvicultural Diagnosis Report in section F of the Firefighter Project File (Project File). Additional information was acquired for both the site specific and landscape level analyses using aerial photo interpretation, flights were conducted in 2004 and 2005.

A mid-scale watershed-level assessment of the landscape was completed in 1998 for the area surrounding and including the Firefighter Project Area. This "Firefighter-Emery/Riverside-Paint Assessment" (FERP Assessment) evaluated the historical and existing condition of resources at the landscape scale, providing a sound basis for development of desired future conditions. The cumulative effects analysis for forest vegetation in this Firefighter Project utilizes the vegetation data and analysis from the FERP Assessment. Refer to section F in the Project File for excerpts and maps from the FERP Assessment pertinent to the Firefighter Project analysis.

Analysis Area

Analysis of direct and indirect effects to vegetation occurs primarily at the stand (treatment unit) level. A list of the specific stands associated with each unit is found in Table 1 of the Silvicultural Diagnosis Report (Section F, Project File).

Analysis of cumulative effects on forest vegetation occurs at the broader watershed level. This is because the ecosystem processes that affect the vegetation resource (primarily fire in this area) often operate at large scales, with fires many thousands or tens of thousands of acres being common historically. Watersheds provide a well-defined area over which meaningful evaluation of the condition and functioning of the ecosystem, and specifically the forest vegetation, can occur. The 1998 FERP Assessment area totaled about 71,000 acres and incorporated numerous watersheds along the east side of Hungry Horse Reservoir, from Emery Creek south to Paint Creek. The FERP Assessment area boundary will be utilized for the analysis of effects of the proposed activities relative to ecosystem processes and the historical range of variability in vegetation conditions. Since the majority of the watersheds in the FERP Assessment area are not

directly affected by the proposed Firefighter Project activities, the smaller and more relevant Firefighter Project area boundary will be used for the bulk of the cumulative effects analysis for forest vegetation in this document. The Firefighter Project Area totals about 15,580 acres and incorporates all or portions of the following drainages: Fire, Spring Meadow, Ada, Hungry Horse, Dudley, Ryle, Seagrid, Riverside, Murray, and McInernie Creeks. Refer to maps in Section F of the Project File for identification of the larger FERP Assessment area and smaller Firefighter Project Area cumulative effects analysis areas.

The temporal bounds of the analysis are designed to capture the direct, indirect, and cumulative effects of the alternatives to forest vegetation within the analysis area. The direct and indirect effects would occur during or shortly following project activities, while the cumulative effects analyses encompasses a period of many decades (50-100 years) into the future and the past, as fitting to the long-lived nature of the dominant plant forms within a forest (trees).

Affected Environment/Existing Condition

Factors Influencing the Existing Forest Condition

Current vegetative conditions in the project area reflect a complex interaction of factors over time and space; some of these are more easily understood and observed (e.g. fire events) and some are less easily observed (e.g. the role of soil microorganisms). Three main factors have the most obvious effect on the character of the existing vegetation in the Firefighter Project Area, these are:

(1) Physical factors of the site (e.g. soil type)
(2) The progressive development of individual plants and communities over time (i.e. succession)
(3) The occurrence of disturbances (e.g. fire, insect epidemics) in time and space killing or affecting growth of individual plants or entire plant communities

Physical Site Description

Glaciation has been the primary land-forming process that has shaped the Firefighter Project area. Glaciers moved down the large drainages and coalesced in the valley bottoms, overtopping the relatively low Firefighter Mountain and surrounding ridges, and creating their rounded shape. Slopes are generally gentle (<45%) with some steeper, glaciated breaklands. Elevation in the project area ranges from about 3,600 feet at the shore of Hungry Horse Reservoir, to about 5,600 feet at the top of Firefighter Mountain. The glaciers retreated about 10,000 years ago. Volcanic eruptions approximately 6,600 years ago set down a layer of volcanic ash across the area averaging 7-inches thick, leaving a rich tree-growing medium.

Landtypes

Landtypes are mapping units that incorporate landforms, geomorphic processes, soils, and vegetation to help describe landscape and site conditions (USDA Forest Service 1983).

The great majority (>10,000 acres) of the Firefighter Project Area are glacial moraine landtypes. Soils are formed in glacial-till deposits, and are sandy to loamy with a volcanic ash influence, generally high in productivity. The cool, moist subalpine fir forest habitat types dominate; slopes are usually from 20-50%. Most of the proposed treatment units fall within this landtype.

Steep glaciated breaklands comprise the majority of the rest of the project area (about 2,100 acres). These areas are a mix of glacial-till and residual soils, typically of low to moderate productivity, and are dominated by the subalpine fir habitat types with some inclusions of Douglas-fir types. These lands have >45% slopes, a minor portion of the proposed treatment units fall within this landtype. The remaining acres (~3,500 acres) of the project area are a mix of different landtypes, including steep glaciated alpine basins and ridges composed of residual soils, rock lands, mass failures, and glacial outwash/stream terraces.

Refer to Map 3 and Table 1 in the Silviculture Diagnosis Report (Section F, Project File) for locations of landtypes and a list of each unit's landtype.

Habitat Types

Habitat types are a classification of a forest or grassland site based upon its potential natural vegetation (i.e. the final vegetation type that would develop over time on that site); as opposed to whatever existing vegetation condition may occur at any given point in time (Pfister et al. 1977). A habitat type reflects the presence of certain site conditions (such as soil type, aspect, precipitation, etc) that influence the diversity, growth, and abundance of grass, forb, and tree species.

The vast majority (about 80%) of the Firefighter Project area is within Habitat Group 7, characterized by cool, moist habitat types noted for their moderate to high productivity for tree growth and diverse vegetative cover. Within this habitat group, subalpine fir/clintonia (ABLA/CLUN) is by far the dominant habitat type; subalpine fir/menziesia (ABLA/MEFE) comprises most of the rest of the group (Pfister et al. 1977). Habitat Group 9 makes up about 15% of the Firefighter Project, with subalpine fir/beargrass (ABLA/XETE) the dominant habitat type. Habitat Group 9 is indicative of sites that are somewhat drier than those in Habitat Group 7 are. They occur most often on aspects that are more southerly or in areas with cold airflow. The remaining 5% of the Project Area is within Habitat Group 2, these are the driest sites usually dominated by Douglas-fir. Douglas-fir/snowberry and pinegrass habitat types (PSME/SYAL and PSME/CARU) occur in these areas.

Refer to Map 4 and Table 1 in the Silvicultural Diagnosis Report (Section F, Project File) for identification of habitat types by unit and location across the project area.

Succession

Succession is the basic ecological process of change in the composition, structure, and function of plant communities over time. The early stages of succession usually follow a disturbance (e.g. fire), which kills all or a portion of the existing plants while leaving the physical environment intact. In the simplified model, the plant community then grows and develops through stages,

which are typically named after the size class of the dominant life form (in this case, trees). For the purposes of this discussion, and specific to the sites and conditions in the Firefighter Project area, the development patterns of vegetation following a disturbance will be divided into three successional stages defined below.

Early Successional Stage

The first 30 years or so after a disturbance, when new plants appear and occupy the growing space left vacant by the death of the previous plants. In forest types, trees are in the seedling and sapling size classes, and are typically up to about 30 feet tall.

Mid-Successional Stage

The mid-successional stage occurs in the decades following the early successional stage (from approximately 30 to 150 years old). All the growth space is occupied, and few or no new individual plant species appear. Existing plants with a competitive advantage are able to expand into growing space occupied by other plants, sometimes killing them. In forest types, trees have grown so that their crowns usually touch each other, and sunlight reaching the ground is diminished. Most trees would be about 6 to 20" diameter breast height (dbh) and 40 to 120 feet tall.

Late-Successional Stage

This stage is comprised of the oldest plant communities, where at least 150 years have passed since the last major disturbance. Mortality of individuals and groups of overstory trees has resulted in increased sunlight reaching the forest floor, allowing some trees in the lower canopy layers to grow into the overstory layers. Multiple layers of tree canopies typically result. This stage is often, but not always, characterized by larger tree sizes (20"+ dbh and 100+ feet tall) and more abundant snag and dead wood components. Old-growth forest is a subset of the late-successional stage. Old-growth forest exhibits specific structural characteristics (varying by habitat type). These may include specific numbers of large, old, live trees; large dead trees; large rotting downed logs; multiple tree canopy layers; and diverse plant species.

Disturbances

Fire and timber harvest are the primary historical factors that have influenced current vegetative conditions within the Firefighter Project Area.

Fire

Fire is one of the primary disturbance factors influencing vegetation in the Northern Rocky Mountain ecosystem, and the Firefighter Project area is no exception. Early field investigations for the U.S. Geological Survey conducted in 1898 (Ayres 1898) suggest that bare areas and small trees (analogous to shrub, seedling/sapling, and pole-sized trees) occupied the majority of the project area at that time, possibly originating from fires within the previous fifty years. Forests that may not have experienced a severe fire for many decades and that were comprised mostly of

larger trees were noted only in the lower elevations and South Fork Flathead River bottoms. See Map 6 in the Silvicultural Diagnosis Report (Section F, Project File) for a display of Ayres forest types in the project area.

Reliable fire history records over the past 100 years indicate that a large part of the Firefighter Project area was burned by wildfires in 1908 and 1910 – a total of 10,584 acres (~68%) of the project area was affected. In 1926, another large fire visited the area, burning a total of 11,800 acres (~76% of the project area). Over 8,000 of these acres were forest that had already burned in 1908 or 1910, and were composed of young, sapling-sized trees at the time of the 1926 fire. All together, nearly 90% of the Firefighter Project area has burned within the last 100 years. Refer to Map 5 in the Silvicultural Diagnosis Report (Section F, Project File) for fire history information in this area. Refer also to the Fire and Fuels section of this Environmental Assessment (EA) for additional information on fire history.

These historical fires have been the primary influence shaping the forest that currently exists in the Firefighter Project area. All of the burned forests regenerated well, mostly to lodgepole pine and western larch, with some Douglas-fir, spruce, and subalpine fir. Today these lands are covered with 75 to 90-year-old forests at the mid-successional stage of development, characterized by dense, single-storied stands of trees 60 to 80-feet tall and typically 5 to 14" dbh. Understory tree layers are comprised of spruce, subalpine fir, and sometimes Douglas-fir, usually sparsely stocked, but sometimes forming a discontinuous layer of dense patches on the moister sites. All but one of the Firefighter Project proposed harvest units occur in these younger, 75 to 90-year-old forests.

Timber Harvest and Pre-Commercial Thinning

After fire, timber harvesting has had the second largest influence on the current condition of the Firefighter Project area forests. About 5,154 acres, or about one third of the Firefighter Project Area, has been affected by timber harvest, with the earliest recorded harvesting occurring in 1951. Map 7 in the Silvicultural Diagnosis Report (Section F, Project File) displays the location of harvest areas and Table 3-2 below lists harvest acres by years.

Table 3-2. Past Harvesting by Decade within the Firefighter Project Area

Harvest Type and Description	Decade of Harvest						Total Acres	Percent of Project Area
	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2006		
Regeneration Harvest (clearcut, seedtree or shelterwood)	188 acres	395 acres	306 acres	565 acres	537 acres	0 acres	**1,991 acres**	13%
Intermediate Harvest (salvage, commercial thin, overstory removal)	610 acres	1,595 acres	350 acres	453 acres	102 acres	53 acres	**3,163 acres**	20%
Total Acres	**798 acres**	**1,990 acres**	**656 acres**	**1,018 acres**	**639 acres**	**53 acres**	**5,154 acres**	**33%**

Most of the commercial harvesting that occurred in the past involved intermediate harvesting, a type of harvest that removed a portion of the trees present. Intermediate harvests were done for a variety of reasons, including salvaging the value of dead or dying trees, improving growth and vigor of remaining trees, or removing older overstory from a younger understory. A fully stocked residual stand remains after an intermediate harvest; the residual stand may range from 70 to >200 trees-per-acre (TPA), and from sapling sized to mature/large trees. This type of harvesting may change the stand structure somewhat by removing the overstory tree layer, but because of the light tree removal, it would cause minimal change in species composition or forest age class.

In a regeneration harvest, all or nearly all of the trees are removed, resulting in a very open area that regenerates to a new stand of conifers. Areas harvested over 20 years ago would now be occupied by sapling trees >15 ft tall. Until the 1980s, regeneration harvesting in the project area was concentrated in the mature forests of spruce, larch, and Douglas-fir that had escaped the fires of the early 1900s. By the 1990s, regeneration harvesting began in the younger forests – those that had their origins after the 1910 and 1926 fires – and this was particularly true in the lodgepole pine dominated forests then approaching 70 years old. Unlike intermediate harvests, regeneration harvests cause dramatic change in the stand-age class, converting older forest (>70 years old) into a young forest of seedlings. Species composition may also change depending upon the species regenerated. Stand structure may be altered, particularly if harvest occurred in older, late-successional forest. Prior to harvest, these stands may have had multiple forest canopy layers and abundant snag or downed wood components. This diversity is typically reduced in the regenerated stand for a time, due to the conversion to a single-storied seedling stand, the reduction in overstory trees, and the reduction of downed wood and snag components.

The vast majority of this past commercial harvesting was accomplished using ground-based mechanized equipment, typically dozers and skidders. Logging slash was normally dozer piled and burned. Reforestation of areas that were clearcut, seedtree harvested, or shelterwood harvested occurred through planting and/or natural regeneration. All of the harvest areas are currently fully stocked, with vigorous young trees up to 40 years old.

Precommercial thinning (thinning in sapling-sized forests) has occurred across many acres of young forest within the Firefighter Project area. Thinning began in the late 1960s in dense stands, approximately 35 years old, that originated after the 1926 fire. This thinning was accomplished by hand and by mechanized methods (i.e. roller thinning – a form of strip thinning using a dozer pulling a large, metal roller to push over trees and crush the slash). Approximately 4,900 acres of precommercial thinning occurred in the project area between 1964 and 1978. The objective was to reduce stand density in order to improve growth and vigor on remaining trees. There were mixed results from this treatment. Some stands responded well because the reduced competition allowed trees to grow larger and the increased light improved the vigor of shrubs, grasses, and other ground vegetation. Other stands had already experienced too many years of suppressed growth and had poor crowns; they were unable to respond well to release from competition.

Precommercial thinning in the regeneration-harvested stands began in the early 1980s, with a reduction in stand density on almost 370 acres of young, 20-year-old sapling stands. Because of

their youth and the timeliness of the thinning activity, these stands responded very well to the reduced competition. Refer to Map 8 in the Silvicultural Diagnosis Report (Section F, Project File) for maps depicting the past precommercial thinning.

Insect and Disease; Other Tree Mortality Factors

Insects and diseases can exert major influence on forest conditions over time, although they are usually less spectacular or noticeable than fire or timber harvesting. Their influence on a year-by-year accounting can appear deceptively inconsequential, but over time, they can cause major shifts in species composition, stand structure, and other characteristics by causing mortality to selective stand components. Sometimes their effects can be quick and dramatic, such as during an insect epidemic. Though insects and disease are a natural component of the ecosystem and accepted as such, their effects (particularly at epidemic levels) may not be a desired condition in some areas from a resource management or social perspective.

Mountain pine beetle has been the major insect of any consequence noticeably affecting existing stand conditions over approximately the past 80 years in the Firefighter Project area. Lodgepole pine is, and has been, the primary species affected, although western white pine has also experienced high mortality. Annual insect and disease flight surveys (conducted by the Forest Service nearly every year since the late 1960s) provide a good database on insect and disease levels and trends. These surveys show that mountain pine beetle was most active in the project area in the years 1978 through 1991 – years in which epidemic beetle populations were occurring throughout the Flathead National Forest and Glacier Park region. Peaks of beetle activity (and subsequent tree mortality) in the Firefighter area occurred in the years 1980, 1981, 1986, 1987, and 1988. In 1980, most of the lodgepole pine in the Firefighter area was only about 50 years old (originating after the 1926 fire) and most trees and stands were of low susceptibility. Stands of highest susceptibility to mountain pine beetle attack are larger diameter (>8" dbh), older age classes (>70 yrs old) and at mid to low elevations. In the early 1980s, the beetles concentrated in the older, large western white pine in the Dudley and Riverside Creek areas. However, by the late 1980s, the lodgepole stands were approaching conditions of high susceptibility and beetle activity began in earnest in these stands, which stretched across large areas of the landscape. Variable amounts of mortality were experienced from this wave of beetles. Since 1991, mountain pine beetle activity has been minor, with only isolated patches and individual trees succumbing to the beetle. Refer to Map 9 in Appendix A of the Silvicultural Diagnosis Report (Section F, Project File) for a map showing infestation areas noted on the aerial surveys.

Currently, the lodgepole pine forests within the Firefighter Project Area have a moderate to high susceptibility to mountain pine beetle attack and mortality. Although they are at the ideal elevation and age for an attack (70 to 90 years old), they are often of relatively small average diameter (≤ 8 inches) due to the dense growing conditions. About 3,600 acres (~23%) of the project area is dominated by mature lodgepole pine forest, with an additional 8,800 acres (56%) of the area in mixed-species forest type (which often has a major component of lodgepole pine). With a sufficiently high population of beetles, large amounts of lodgepole pine mortality could be experienced in the project area in the future.

Larch needle diseases are the only other insect or disease factor that was noted on the aerial surveys, affecting larch in 2003 and 2006. Minor impact to the larch occurred, with little or no mortality directly attributed to the diseases, though some temporary impact on tree growth may have occurred. Refer to Map 10 in Appendix A of the Silvicultural Diagnosis Report (Section F, Project File) for a map showing infestation areas noted on the aerial surveys.
Other mortality factors, (e.g. blowdown), are localized and minimal in the project area, with no large regions affected.

Existing Forest Composition, Size, Age, and Structure

Landscape (Project Area)

The vast majority (~12,600 acres or >80%) of forests across the Firefighter Project area landscape are in a mid-successional stage of development. These forests originated following the intense, stand replacing fires early in the 20th century; they are currently comprised of 70 to 100-year-old trees, 60 to 75 feet tall, and 4 to 14" dbh. An estimated 16% (~2,700 acres) of the project area is in an early successional stage, dominated by seedling and sapling trees less than 30 feet tall. These stands originate from past timber harvest activities and are <45 years old. Very few late-successional or old-growth stands occur in the project area; these stands cover an estimated 300 acres (~2% of the Firefighter Project area). There are few of these stands primarily because of the extent and intensity of the 1910 and 1926 wildfires, which burned over nearly 90% of the project area. These older stands occur as relatively isolated patches in the Hungry Horse Creek drainage, and in a few creeks in the Dudley Creek drainage (Tent, Seagrid, and Ryle Creeks).

Stands that are composed of a mix of lodgepole pine and western larch occur across an estimated 44% (nearly 7,000 acres) of the landscape. Both species are well adapted to regeneration and development in an ecosystem where fire is the dominant disturbance factor. Douglas-fir is often a component of these stands, especially on warmer, drier sites. Stands where lodgepole pine is dominant (>70% of the trees in a stand) occur across an estimated 28% (~4,400 acres) of the landscape. The remaining acres are a spruce/subalpine fir forest type, although western larch, Douglas-fir, and lodgepole pine can be common species in some stands. The spruce and subalpine fir types are most prevalent on the moist, northerly aspects of the project area.

Forests in the project area are primarily single-story (one main canopy layer), but many two-storied stands exist (stands with moderate to large number of shorter, understory trees) especially on moist, northerly aspects. Most understory tree species are shade-tolerant spruce and subalpine fir; Douglas-fir is also a common understory species.

Maps 11 through 14 found in the Silviculture Diagnosis Report (Section F, Project File) display the forest age, size, and composition across the Firefighter Project Area.

Stand (Units)

Nearly all of the acres proposed for treatment (~711 acres, 95%) are composed of stands that originated after the 1926 fire; these stands have 75 to 80-year-old trees, which are 60 to 70 feet

tall. No older-forest stands (late-successional or old-growth forests) are proposed for treatment. About half of the treatment units are dominated by lodgepole pine; the remainder is of mixed-species composition, usually western larch with some lodgepole pine. Minor amounts of Douglas-fir, spruce, and subalpine fir occur in the units. Table 3-3 describes the forest conditions by groups of units, which were grouped by similar forest condition. Detailed descriptions of forest composition, structure, age and size classes, density, and condition, by unit, can be found in the Silvicultural Diagnosis Report (Section F, Project File).

Table 3-3. Summary of Current Forest Conditions by Stand Group and Unit.

Stand Group	Units in Group	Acres	Current Forest Condition
Group 1	Units 3, 5, 6, 7, 8, 13, 14, 15, 18, 20, 23, 26, 29, 30, & 61	270 acres	Mature lodgepole pine forest in designated deer/elk winter range (MA13 or 7/13). Stands are ~75-80 years old with high tree density (500+ tpa). Tree heights range from 50-65', dbh ranges from 3-9". Some stands have minor amounts of other species, usually larch or Douglas-fir, but occasionally spruce or subalpine fir. Sparse understory trees occur (spruce/subalpine fir) in most stands, understory vegetation is mostly low shrubs and forbs (huckleberry, beargrass) although patches of taller shrubs (maple, alder) occur in some stands. Amount of dead woody material (standing and down) is variable, light to heavy concentrations in areas where mortality and blowdown occurred.
Group 2	Units 9b, 9c, 11, 19, 21, & 60	266 acres	Mixed-species stands in designated deer/elk winter range (MA13 or 13/16), with larch (occasionally Douglas-fir or spruce) occupying >50% of stocking, and lodgepole pine composing the remainder of the stand. Stands are ~75-80 years old, fully stocked (300+ tpa), with trees 60-70' tall and 5-12" dbh. Understory tree density varies; it is usually sparse but some moderately dense patches of spruce/subalpine fir occur on moist sites. Understory vegetation consists of low- to medium-height shrubs and forbs (huckleberry, alder, maple, and beargrass). Dead woody material amounts are variable, mostly light to moderate.
Group 3	Units 16, 40, 47, 49, 50, & 56.	107 acres	Mature lodgepole pine stands outside of designated deer/elk winter range (MA 15 or 7/15). Group 3 has the same stand characteristics as Stand Group 1.
Group 4	Units 2a, 2b, 41, & 43	98 acres	Mixed-species stands outside of designated deer/elk winter range (MA15). Group 4 stands have the same stand characteristics as Stand Group 2.
Group 5	Unit 70	8 acres	Douglas-fir progeny test-tree plantation established in 1995, within a stand that was clearcut and broadcast burned in 1993/94. Sapling tree stand comprised of naturally regenerated lodgepole pine and the planted (1995) Douglas-fir.

Snags and Downed Wood

The quantity of dead wood varies across the Firefighter Project area, depending on stand history and condition. An assessment of these features at the landscape scale is based on an understanding of the major role fire plays in stand origination in this ecosystem, and of changes that occur through the natural aging (succession) of stands over time.

Because of the lack of any large-scale fires in the project area over the last 80 years, mid-successional stands (40 to 140 years old) cover the majority of the land. Except where lodgepole pine is dominant, these stands are at the stage of development where downed wood and snag components are at their lowest level; trees are relatively young, mortality is low, and the dead trees from the originating fire event have fallen and rotted. This stand condition occurs across an

estimated 8,600 acres (~55%) of the project area. Although down wood and snags tend to be at low levels in these stands, a few areas of localized higher dead wood concentrations may occur due to blowdown events or disease.

This situation often differs in mid-successional lodgepole pine stands because of their generally shorter life span, their tendency to grow in very dense stands (in which mortality due to inter-tree competition is high), and their susceptibility to mountain pine beetle (which commonly attacks and kills mature trees, either individually or in epidemic conditions). Because of this, mature (80 to 100-year-old) lodgepole pine stands may develop high levels of downed wood and snags, particularly of smaller size classes (<14" dbh snags). Mature lodgepole pine stands cover an estimated 3,600 acres (~23%) of the project area. Dense stocking in many of these lodgepole pine stands has resulted in the continual recruitment of small diameter snags and down wood as trees die from competition for light and water. In addition, mountain pine beetle epidemic conditions occurred across the project area in the 1980s and caused varying degrees of mortality, particularly in large-diameter trees. Many of the beetle-killed trees have now fallen to the ground and become part of the downed wood component. As a result, the mature lodgepole pine stands in the Firefighter Project area have varying amounts of downed wood and small diameter snags, ranging from light to heavy concentrations.

Under a natural disturbance regime, forests in the early successional and late-successional stages of development tend to have the highest amounts of dead wood, both standing and down. In the early successional stands, this is due to the presence of residual dead trees from a previous disturbance (e.g. fire). In the late-successional stands, it is due to the increasing mortality that comes with the decreased vigor and the natural aging of trees. However, the early successional stands in the Firefighter Project area were created through timber harvesting and have very low amounts of dead and down wood. The material was removed either as a commercial product or by piling and burning of the slash. This early successional past harvest condition covers an estimated 16% (~2,700 acres) of the project area. The late-successional stands, where downed wood and snag levels are relatively high, occur across <2% of the project area.

Large-diameter snags are of high value to wildlife while standing, and to the soils and organisms that live at ground level when they fall. Many of the forests in the Firefighter Project area contained large western larch prior to the fires in 1910 and 1926; those trees were killed by the fires. Larch snags in particular have the ability to stand for many decades, and many of the fire-killed larch are still standing, although harvesting and firewood cutting since the 1950s have greatly reduced the number of large diameter trees in areas accessible from roads. Consequently, small diameter snags are abundant in the project area, but larger snags (>20" dbh) are less abundant and fewer in number than if the area were unroaded and unharvested.

Desired Conditions for Forest Vegetation

Historical range of variability (HRV) is a term used to describe the natural fluctuation of ecosystems and conditions over time, as they respond to ecological processes under a low level of human influence. It can provide clues for designing management strategies that maintain ecological integrity. The 1998 FERP Assessment determined desired conditions for the broad landscape area based on the HRV and management objectives for a variety of resources. A brief

summary of these conditions follow; more detailed excerpts from the FERP Assessment of the existing, historical, and desired conditions related to the forest vegetation can be found in the Silvicultural Diagnosis Report in Section F of the Firefighter Project File.

The overall desired condition identified in the FERP Assessment, related to forest vegetation, was to create landscape patterns and vegetation conditions that resemble historical conditions, to help ensure sustainability of all components of the ecosystem. The following desired conditions represent an understanding of the historical role fire has played across this landscape; including both large, stand-replacing fires, and mixed-severity fires.

The desirable range for early successional forest is 10-35% of the landscape. Larch would be present as a major species along with lodgepole pine, Douglas-fir, and western white pine; whitebark pine may occur on suitable sites. Another 25-55% of the landscape would be in a mid-successional stage of development, typically single-story or two-storied forests with trees <140 years old. These would be composed of the same early successional species, but with spruce and subalpine fir showing some dominance as shorter-lived species (e.g. lodgepole pine) begin to die. An additional 10-35% of the land area should be composed of late-successional and/or old forest conditions. These would be stands of larger tree, often two or more canopy layers, and a mix of species including larch, Douglas-fir, western white pine, spruce, subalpine fir, and whitebark pine. In all cases, the size of the forest patches in these successional stages should be large, several hundred acres in size, rather than small patches that fragment the landscape.

Currently, the early successional forest covers from 22% (in the low- to mid-elevation zone) to 33% (in the colder high-elevation zone) of the land area within the FERP Assessment area. This is within the desired range of variability, although these young forest types tend to be in small patches scattered across the landscape (especially in the Firefighter Mountain area) and devoid of dead wood. This condition is far different than the very large patch sizes and high dead and/or down wood component that would be created under a natural fire scenario.

Mid-successional forests currently cover an estimated 42% (cold/high elevation areas) to 65% (low- to mid-elevation areas) of the land area. These levels are above the desired range of variability. Given the continued suppression of wildfire, the steady growth of sapling stands from previous harvests, and the current trend towards reduced level of regeneration harvesting, the FERP Assessment concluded there was an overall trend towards an increasing amount of mid-successional forest over time. Directly correlated with this would be a decrease in early successional forest across the landscape.

Late-successional forest covers about 13% of the landscape, the low end of the desired range. About 40% (~3,300 acres) of this late-successional forest was identified as old-growth forest, (~5% of the FERP Assessment area). A trend towards increasing late-successional and old-growth forest was identified, because some of the mid-successional forest would continue to age, gradually developing into old forest conditions (barring any major disturbance, such as fire).

Forests dominated by early successional species (larch, lodgepole pine, Douglas-fir, western white pine, and whitebark pine) currently occupy about half of the landscape area, a reflection of

the relatively large portion of the area still in a young stage of development (early to mid-successional stands). Early successional species would decrease in dominance over the next 100 years, particularly in stands dominated by the shorter-lived, beetle-susceptible lodgepole pine. A corresponding increase in spruce and subalpine fir (and Douglas-fir on drier sites) would occur. Western white pine and whitebark pine would continue to decrease in abundance, largely due to mortality from white pine blister rust (an introduced disease).

Desired conditions at a site-specific, forest-stand level would include resilient forests and diverse stands composed of larger trees that provide a variety of resource benefits (e.g. wildlife habitat, forest products). The desired condition would be achieved by maintaining a mix of species, adequate tree stocking, and growth rates to achieve trees of larger size. Target stand condition details can be found in the Silvicultural Diagnosis Report in Section F of the Project File.

Environmental Consequences

Introduction

The direct, indirect, and cumulative effects of the proposed treatments on the forest resource are discussed in this section. Effects to other resources (e.g. wildlife) due to changes in the forest conditions are discussed in their respective sections of this document. To focus the forest vegetation analysis and describe relevant effects, the following effects indicators will be used:

- The total acres treated within each stand group.
- The resulting effects to forest conditions at the stand and landscape level (stand/tree vigor, growth, structure, species composition, understory vegetation, snags and downed wood, insects, and disease).

Refer to Table 3-3 for a detailed description of the stand groups.

Reference information used for the forest vegetation analysis includes the detailed descriptions of the proposed treatments for each unit by alternative found in Chapter 2 of this EA and Section F of the Project File; and the detailed descriptions of the existing and desired stand conditions for all treatment units found in the Silvicultural Diagnosis Report, Project File, Section F.

The following table (Table 3-4) summarizes the various activities and affected acreage associated with the Action Alternatives. Detailed tables showing the treatments for each individual unit are found in Chapter 2 of this EA and in Section F of the Project File. Discussion of the actual effects of these actions on the forest vegetation follows these tables.

Table 3-4. Summary of Project Activities by Alternative

Activity	Alternative 1 Acres Treated	Alternative 2 Acres Treated
Acres Treated by Group		
Group 1 (Mature lodgepole stands in MA 13*)	270	67
Group 2 (Mixed-species stands in MA 13)	266	75
Group 3 (Mature lodgepole stands outside MA 13)	107	107
Group 4 (Mixed-species stands outside MA 13)	98	98
Group 5 (Douglas-fir test-tree plantation – sapling stand)	8	8
Total Acres Treated	**749 acres**	**355 acres**
Acres Treated by Harvest Type		
Seedtree Harvest (Leaving ~5-20 tpa)	377	107
Shelterwood Harvest (Leaving ~30-50 tpa)	339	73
Thinning (Leaving ~60-80 tpa, except ~250 tpa in Unit 70)	33	175
Total Acres Treated	**749 acres**	**355 acres**
Acres Treated by Reforestation Method		
Planting	476	168
Natural Regeneration	240	73
None	33	114
Total Acres Treated	**749 acres**	**355 acres**
Acres Treated by Post-Harvest Activity		
Prescribed Burn (Underburn)	543	7
Mechanized (Excavator pile)	198	340
Hand Treatment (Lop and Scatter)	8	8
Total Acres Treated	**749 acres**	**355 acres**
Acres Treated by Logging Method		
Mechanized (Tractor, skidder)	525	340
Cable/Skyline	65	7
Helicopter	151	0
Hand Thin	8	8
Total Acres Treated	**749 acres**	**355 acres**

* Designated elk/mule deer winter range, as per the Flathead National Forest Plan

Alternative 1 (No-Action Alternative)

Direct, Indirect, and Cumulative Effects

Effects to Forest Conditions

No treatment of forest stands would occur under this alternative, and thus no direct or indirect effects to the existing forest conditions would occur. Existing forest condition was described in the "Affected Environment/Existing Condition" section of this EA. Forests would continue to develop along their natural trajectory. In all stands, increasing tree density would increase competition among individual trees for light and moisture. The cumulative effect would be a

reduction in growth rates and tree/stand vigor over time. In some stands, this would result in increased tree mortality over time from various factors including insects, diseases, and suppression. This effect would be most pronounced in the lodgepole pine dominated stands within treatment Groups 1 and 3. Lodgepole pine is a relatively short-lived species that reaches its growth peak around 70 years old, after which it experiences a relatively rapid decline in growth and vigor (over succeeding decades) and an associated increase in susceptibility to insects and diseases. Increased mortality of the forest overstory trees would cause increased accumulation of dead and down wood, and a corresponding decrease in tree density. In some stands, this opening up of the dense forest canopy would stimulate the growth of other tree species in the overstory and the understory (if they are present), as well as the ground vegetation. These changes in stand structure and vegetation over time would have corresponding effects to other resources, such as increased risk of higher severity fire, improved foraging opportunities for elk/mule deer, and decreased value as snow intercept cover for elk/mule deer.

Stands within Groups 2 and 4 are similar in age and structure to those in Groups 1 and 3. However, Groups 2 and 4 are mixed-species stands with less lodgepole pine and they are typically less densely stocked with trees; consequently, there would be less overall mortality of trees and subsequent changes in stand conditions over time than in the lodgepole pine stands of Groups 1 and 3. Larch and Douglas-fir are capable of living for several centuries, and larch in particular is resistant to most insects and diseases. What lodgepole pine does occur within these stands would become increasingly susceptible to mortality from mountain pine beetle and other factors, but since the lodgepole compose a lower amount of overall stand stocking than in Groups 1 and 3, less loss of trees to natural mortality would be expected into the future. Growth rates may continue to decline in stands that are currently at high densities due to continuing inter-tree competition.

Under Alternative 1, no thinning would occur in the Douglas-fir test-tree plantation (Unit 70). Lack of thinning would result in the planted Douglas-fir being overtopped and crowded by the naturally regenerated lodgepole pine, reducing their growth and vigor. This would hinder the ability of the planted Douglas-fir to produce genetically superior seed, and would waste the investment made to establish this plantation.

Under Alternative 1, some stands of desirable species composition and lower tree density would have the potential to develop into a desirable old forest condition, barring any major disturbance (e.g. fire). There are many stands of this type within Groups 2 and 4; they are primarily mixed-species forests (larch, Douglas-fir, spruce, etc) of moderate- to low-density. They have the potential to develop old trees of large sizes, and the desirable multi-canopy structure of an old-growth forest. Western larch and Douglas-fir commonly reach 30” dbh or greater under good growing conditions and often live several centuries, aided by their ability to survive low- to moderate-intensity fires when mature.

Stands in Groups 1 and 3 (dominated by lodgepole pine) do not have the species composition or tree density that would allow development of large, old trees – a primary component of old-growth forest. Lodgepole pine are relatively small trees (a large lodgepole on these sites would be ~16” dbh), especially under the heavy competition they have experienced in these dense

stands. They are relatively short-lived, with many (or most) succumbing to beetle attack, root disease, fire, or blowdown before they are 120 years old.

Effects to Insect and Disease, Other Mortality Factors

Lodgepole stands would become increasingly susceptible to mountain pine beetle attack in the immediate future, with increasing probability of mortality as they age. Risk of epidemic beetle population levels and associated high tree mortality would increase within stands and across the larger landscape into the near future. This effect would be most pronounced in treatment Groups 1 and 3, where lodgepole pine is the dominant species; lodgepole also composes a major component of some of the Group 2 and 4 stands.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

Effects to Forest Conditions

Regeneration Harvest

A total of 716 acres of seedtree or shelterwood regeneration harvest would occur under Alternative 2; approximately 536 of these acres are in treatment Groups 1 and 2, which are within Forest Plan designated elk winter range (MA 13 and most of MA 7). This equates to about 7-8% of this designated winter range area. The remaining 180 acres would be in treatment Groups 3 and 4 and outside of designated elk winter range. These units occur on the upper slopes and northerly aspects of the Firefighter Mountain area.

A regeneration treatment would be proposed for almost all of the units for two main reasons: (1) the desire to create the open conditions that would promote shrub development and subsequent elk foraging opportunities; and (2) because of the prevalence of densely stocked, mature lodgepole pine in the units. Lodgepole pine would be targeted for removal, due to its declining growth and risk of mountain pine beetle infestation. Western larch and Douglas-fir (unless in seriously poor condition) would be left within all units at a density of 5-50 trees per acre, depending upon the existing occurrence and condition of these species. These species would be favored for leave trees because of their greater growth potential and longevity compared to the lodgepole pine, and their contribution to increased species diversity in the future stand and across the landscape.

In the short term, regeneration harvests would convert existing relatively dense forests, mostly dominated by lodgepole pine, into open conditions dominated by shrubs, forbs, grasses, and conifer saplings. This type of treatment, combined with low-intensity prescribed burning after harvesting, would dramatically increase the amount of light reaching the ground and would achieve the desired vigorous growth response in the existing understory shrubs, improving the foraging value of the stand. Preserving the existing Douglas-fir and western larch trees within these units, and the proposed planting of Douglas-fir and other tree species after harvest, would be designed to create desired conditions in the long term for elk and mule deer habitat. As these forests of more diverse species composition and less dense stocking levels develop and grow

through time, they would likely provide greater snow intercept and thermal cover values compared to dense lodgepole pine forests. Refer to the analysis disclosed in the Wildlife section of the document for further discussion of these effects.

Reforestation in Regeneration Harvest Units

The sites proposed for treatment are all of moderate to high productivity for tree growth and development. All of the seedtree and shelterwood harvest units would be regenerated to a new stand of young, conifer seedlings; survival of seedlings would be expected to be high on these sites. Lodgepole pine would regenerate naturally to some extent in all units. Douglas-fir, larch, and/or western white pine seedlings would be planted on certain sites because adequate seed sources are not available to ensure natural regeneration of these desired species. These species require full or nearly full sunlight to grow well, and increased sunlight would be a result of the regeneration harvest treatments. Regeneration of a mix of species, planting where necessary, would ensure that desired future conditions would be met. Desired conditions include a dramatic improvement in tree species diversity, stand growth, and vigor for the benefit of a variety of resources, including wildlife habitat and timber production. These treatments would create the species mix and stand densities that in the future would be likely to be more favorable habitat for wintering elk, providing excellent snow intercept and thermal cover values, and greater stability over time than the densely stocked lodgepole pine forests. These treatments would also increase the proportion of long-lived, early seral species that have a high potential to develop into forests with large trees and more resistance to the effects of future disturbance events (e.g. fire, windthrow, & insects).

Planting would occur on a total of 476 acres of the total 716 acres of regeneration harvest units. Within designated elk winter range, 369 acres (of 536 total harvested acres) would be planted (Group 1 and Units 9b, 11, 21, & 60 in Group 2). Outside of winter range, 107 acres (of 180 total harvested acres) would be planted (Group 3). The remaining 240 acres of regeneration harvest units (Group 4 and Units 2b & 9c in Group 2) would regenerate naturally to Douglas-fir, larch, and lodgepole pine as these units would have adequate seed sources and site conditions to assure this result.

Thinning Harvest

Thinning would be applied to Unit 2a, a 75-year-old western larch and lodgepole pine stand, and Unit 70, a 13-year-old Douglas-fir test-tree plantation. Thinning would remove most or all lodgepole pine; western larch and Douglas-fir would remain as leave trees. Thinning would reduce stand density, widening the distance between tree crowns and increasing the amount of light reaching the remaining trees and forest floor. Leave tree spacing would vary depending upon the current distribution of the desired leave tree species; about 50-70 TPA of western larch would remain in Unit 2a, and 250-300 TPA of sapling-size Douglas-fir and lodgepole pine in Unit 70. Because larch and Douglas-fir would remain, and lodgepole pine would be removed, stand composition within the thinned areas would shift towards a larch and Douglas-fir forest type from the current lodgepole pine type.

Thinning reduces inter-tree competition and increases the availability of light and moisture to leave trees. This would have the effect of maintaining or improving leave tree vigor and growth, creating the potential for substantial increase in the size of individual trees over time. This would occur in Unit 2a because the 75-year-old larch and Douglas-fir leave trees would still be immature, with good crowns and a greater capacity than lodgepole to respond to the treatment with increased growth rates. The development of larger, healthier trees would result in a greater stand/forest resistance to the effects of insects, disease, fire, windthrow, and other factors that may damage or kill trees. These changes would also influence the current and future value of these stands for other social and natural resource values, including wildlife habitat, development of large trees as components of old-growth forest, and production of wood products (refer to respective resource sections in this EA).

Thinning in Unit 70, the Douglas-fir test-tree plantation, would release the planted, genetically superior Douglas-fir saplings from the current crowding by naturally regenerated lodgepole pine. Thinning would allow the Douglas-fir the freedom to grow to their full potential, and produce genetically superior seed for collection.

Understory Vegetation and Snags/Downed Wood

All regeneration harvested units within designated elk and deer winter range would be treated with a prescribed burn post-harvest (Groups 1 & 2); a total of 536 acres would be burned. The primary objectives would be to promote the growth of desirable shrub species for ungulate forage and to reduce the slash from harvest activities to acceptable levels for fire hazard and planting operations. Prescribed burning would more closely emulate the natural disturbance process in this landscape, and promote a more natural response in the development of shrubs and other forest vegetation. It would also reduce the risk of soil disturbance that can result from mechanical treatment of the slash following harvesting. The response of shrubs to this harvest and burning treatment would be expected to be vigorous and abundant. Refer to the Wildlife section in this document for more information.

Mechanical treatment of the slash (i.e. piling by excavators) would occur in units in Groups 3 and 4 wherever the slopes are conducive (<35%); this would occur across about 198 acres. Prescribed burning of the slash would occur in Unit 40 (7 acres, Group 3), a unit with steep slopes where operation of equipment would not be feasible. These treatments would reduce down wood amounts to 12 tons per acre or less, to reduce fire hazard and allow planting or natural regeneration to occur. Disturbance or scarification of the soil would be minimized to avoid damage to roots of understory shrubs and other vegetation. The woody material left on the forest floor would provide for a variety of resource values (e.g. soil protection and wildlife). Refer to specific resource sections in this EA for further information.

Hand lopping and scattering of the cut sapling trees would occur within Unit 70, this would reduce fire hazard and increase the decomposition rate of the woody material.

Abundance and diversity of understory vegetation would increase across all 749 acres of harvest units due to the increased light reaching the forest floor. Currently, understory vegetation is very sparse in some of the densest stands due to canopy shading, particularly in the lodgepole stands

in Groups 1 and 3. The increase in understory vegetation would have effects on other resources, particularly the wildlife habitat value of the area (refer to the Wildlife section of this EA). Some treatment areas contain hardwood trees or tall shrubs, including birch, cottonwood, and maple. These hardwood and shrub species are not targeted for removal and would be left intact except where they impede the implementation of the treatments (e.g. on a log landing). Their retention would improve the wildlife habitat value of the treated area and would provide a more diverse forest and pleasing appearance.

The larger-diameter standing-dead trees, which are of particular value to birds and other wildlife (i.e. >16" dbh larch and Douglas-fir), would be left whenever and wherever possible. Standing-dead trees would be felled only if they would be a safety hazard while harvesting, or if needed to facilitate implementation (e.g. they occurred on a log landing). This direction was adhered to in units harvested in the early 1990s in the Firefighter Project area, and it resulted in the successful retention of many large-diameter western larch snags scattered throughout the harvested units. Therefore, it would be expected that many of the large larch snags would also be left standing after implementation of this alternative. Some snags have fallen since the early 1990s due to natural attrition, and some that were near open roads have been removed by firewood cutters. However, nearly all proposed units in this project would occur along closed roads, and loss to firewood cutters would not be a concern.

Effects to Late-Successional/Old-Growth Forest

No late-successional or old-growth forest would be proposed for treatment, so no direct or indirect effect to these forests would occur under Alternative 2. All stands that would be treated are comprised primarily of trees less than 100 years old.

Effects to Insect and Disease, Other Mortality Factors

The risk of tree mortality due to insects and disease would be reduced in all treatment units. This would be due to the improved tree vigor that would occur after reducing stand density; the removal of the more susceptible, less vigorous trees (i.e. mature lodgepole pine); and the shift to more diverse tree species composition through regeneration of a new, young stand of conifers. The larch and Douglas-fir trees left in the units would have a greater potential for improved growth and vigor with the reduction of competition. However, some of the most aggressive organisms, including bark beetles and Armillaria root disease, could still overcome a healthy tree's natural defenses; treatments would not remove all risk of mortality from these elements.

Windthrow of the residual trees may occur within the harvested areas. Trees that have developed and grown for long periods in conditions of higher stand density tend to be less windfirm than those that grew in conditions that are more open. Were a stand to be opened up, the support and wind shielding provided by adjacent trees would be reduced, and the remaining trees would be more susceptible to windthrow. This effect would be most pronounced in stands where shallow-rooted species such as lodgepole pine, spruce, and subalpine fir are dominant. Because most of the lodgepole pine would be removed in the harvested areas, the risk of windthrow would be relatively low. In the regeneration units, the remaining overstory trees would be at relatively low densities, so if they were to blow down there would be too few to cause a fire-hazard concern. In

addition, they would add to the downed wood component, providing benefits associated with soils and wildlife.

Prescribed burning would be proposed across 543 acres (nearly 75%) of the harvested area. The treatment prescription proposes leaving most or all of the western larch and Douglas-fir that exists within these units, along with some lodgepole pine in those units with very few larch or Douglas-fir. Most leave trees are young and relatively small (<12" dbh) and thus susceptible to mortality from the underburning. The burning would be conducted under moisture and weather conditions that would result in a low intensity fire, which would stimulate shrub growth (the primary reason these areas are proposed for burning) yet minimize mortality of the leave trees. The burning prescription would specify a target of ≤10% tree mortality, with a maximum acceptable of 30% mortality. This variation would be anticipated because of the diversity in tree size, species, and susceptibility to fire and the variable burning conditions that would exist across the treated areas.

Travel Management Effects to Future Timber Management

Alternatives 2 and 3 both propose the same changes to travel management. These changes would include decommissioning 13.8 miles of road currently closed to motorized use, berming 14.9 miles of road currently closed to motorized use, and gating (closed yearlong) 1.3 miles of road currently open to motorized use. The need to improved grizzly bear security would be addressed by increasing grizzly bear security core from the existing 51% up to 68% (meeting Forest Plan standards) following implementation of the Firefighter Project.

These road management changes would substantially impact future forest management in the Firefighter Project area. Forest management activities affected could include activities such as thinning (in both young sapling and older stands); the salvage of diseased, dead, or wind-thrown trees; regeneration harvesting to establish a new stand of young trees; and many others. The decommissioning of roads and the restrictions in road access would greatly reduce options for future management and available treatment methods, and treatments could become economically or technically infeasible. Experience has shown the complexities and difficulties of planning and implementing projects using closed or temporary roads generally leads to greatly increased costs at all stages of development.

Alternative 3

Direct and Indirect Effects

Effects to Forest Conditions

Regeneration Harvest

A total of 180 acres of seedtree or shelterwood regeneration harvest would be proposed under Alternative 3. All these occur within units outside the Forest Plan designated winter range area; no regeneration harvests are proposed within designated elk winter range.

The regeneration harvests are proposed for units dominated by, or containing a large proportion of, mature lodgepole pine. As described under Alternative 2, lodgepole pine would be targeted for removal, due to its declining growth and risk of mountain pine beetle infestation. Western larch and Douglas-fir (unless in seriously poor condition) would be left within all units, leaving a density of 5 to about 40 trees per acre, depending upon the existing occurrence and condition of these species. These treatments would convert existing dense forest stands to open conditions, with the associated effects to vegetation as described under Alternative 2, except on substantially fewer acres across the project area. This decreases the overall benefit of increased forest productivity, species diversity and change in stand structures short and long term that were described under Alternative 2.

Reforestation

As with Alternative 2, all the seedtree and shelterwood harvest units would be regenerated to a new stand of young conifer seedlings, either through natural regeneration or by planting. Survival of seedlings would be expected to be high on these sites. Lodgepole pine would be expected to regenerate naturally to some extent in all units, along with larch and Douglas-fir on some sites. Planting of Douglas-fir, larch, and western white pine seedlings would occur on about 107 acres of regeneration harvest units (Group 3) because adequate seed would not be available to ensure natural regeneration of the desired species. These species require full or nearly full sunlight to grow well, increased light would be provided by the regeneration harvest. Planting of Douglas-fir, larch, and western white pine would ensure the desired conditions were met for these units, including improved species diversity, stand growth, tree-size potential, stand vigor, and improved resistance to future disturbances. However, this benefit would be achieved across very few acres within the project area as a whole.

Douglas-fir seedlings would be planted on 61 acres in four thinning units under Alternative 3. The objective would be to establish tree species more favorable to long-term development of quality elk habitat conditions, as described more fully under Alternative 2 and in the Wildlife section of this document. Douglas-fir would be planted because it has a greater capability to survive and grow under the partial-shade conditions that would exist in the thinned units than either larch or lodgepole pine. However, growth of the Douglas-fir would be substantially reduced under these shaded conditions, and the development of favorable stand conditions would take longer to achieve than in a more open seedtree environment.

Thinning Harvest

Thinning would be applied to all nine units (142 acres) within the Forest Plan designated winter range area. These all occur in the Firefighter Mountain area; there are no treatments proposed in the Murray Winter Range area (refer to Wildlife section).

Thinning would retain approximately 90 to 120 overstory trees per acre, mostly lodgepole pine, but also western larch and Douglas-fir where they exist. Thinning would reduce inter-tree competition, increasing the availability of light and moisture to remaining trees. In stands where trees are relatively healthy and with adequate crowns, this would result in improved growth, vigor, and ultimate size of individual trees in the stand. However, most of these units are dominated by mature, 75-year-old lodgepole pine that have been growing in relatively dense

conditions and have relatively poor crowns, and where few (<30 TPA) other species are present. These trees would have a much-reduced capacity to respond to the increased light and moisture that a thinning would provide, and there would be a relatively low potential for any measurable increase in tree growth following thinning in these stands. However, the decreased tree density and increased light and moisture that would result from thinning would likely still allow trees to maintain their current growth rates for some time into the future.

In addition to the thinning of all Group 1 and 2 units, Unit 2a (25 acres) and Unit 70 (8 acres) outside of designated elk winter range would be thinned. Unit 2a would be a 75-year-old western larch and lodgepole pine stand in treatment Group 4. Unit 70 would be a 13-year-old sapling-sized Douglas-fir test-tree plantation in Group 5. The effects of these treatments would be the same as described previously for Alternative 2.

Understory Vegetation and Snags/Downed Wood

Because of the density of the leave trees that would remain in the thinned units, there would be less sunlight reaching the ground as compared to a regeneration harvest (proposed under Alternative 2). Some response and improvement in the growth of shrubs and other understory vegetation would probably occur within the thinned units, but this would be substantially less than in the regeneration and prescribed burn treatments proposed under Alternative 2. No prescribed burning of the thinning units would be proposed in Alternative 3 because of the unacceptably high risk of mortality to the small diameter leave trees that would occur.

Most of the units would receive mechanical fuels treatments following harvesting, which would reduce slash loadings to acceptable levels. There are two exceptions to this:

1. Unit 40 (7 acres) would be prescribed burned. This unit would be outside of designated elk winter range and located on a slope too steep for equipment. It would be prescribed burned in the same manner and with the same effects described under Alternative 2.
2. Unit 70, the Douglas-fir test-tree plantation, would be hand treated in the same manner and with the same effects as described under Alternative 2.

Mechanical treatments would be conducted on all other units in the same manner, and would have similar effects, as described for Alternative 2, although more acres would be mechanically treated in Alternative 3 (340 acres). Disturbance or scarification of the soil would be minimized to avoid damaging the roots of understory shrubs and other vegetation. However, the potential exists for greater damage to soils and shrubs whenever mechanical equipment is used for slash reduction, compared to understory burning. In addition, the stimulation and flush of nutrients provided by the burning, as described under Alternative 2, would not be realized with mechanical treatments. The response of understory shrubs and other vegetation would be expected to be less vigorous for the mechanically treated units under Alternative 3 compared to the burning regime of Alternative 2. Refer to the Wildlife section in this EA for additional discussion of this effect.

Hardwood trees and larger diameter standing dead trees would not be targeted for removal and would be left on the site; refer to this discussion under Alternative 2

Effects to Late-Successional/Old-Growth Forest

No late-successional or old-growth forest would be proposed for treatment; thus, no direct or indirect effect to these forests would occur under Alternative 3. All stands treated would be composed of trees less than 100 years old.

Effects to Insect and Disease, Other Mortality Factors

The risk of tree mortality from insects and diseases would be reduced across the 180 acres of regeneration harvested forest, and within Units 2a and 70 where thinning would remove the most susceptible trees. This effect would result from the removal of the more susceptible, less vigorous trees (i.e. the mature lodgepole pine) and, through reforestation, the shift to a young, new stand of diverse tree species composition. The decreased risk would also be due to the improved vigor of trees attributable to both reduced stand density and the favoring of larch and Douglas-fir as leave trees; this would be particularly true in units to be thinned (Units 2a and 70). The larch and Douglas-fir trees left in all units have greater potential for improved growth and vigor upon the reduction of tree competition. However, some of the most aggressive organisms, such as bark beetles and Armillaria root disease, may still be able to overcome a healthy tree's natural defenses, and treatments would not remove all risk of mortality from these elements.

In the thinned units (except Unit 70) within the designated elk winter range (142 acres), some reduction of the risk to mountain pine beetle may be realized. This would occur because thinning changes the microclimate within the stand, which may make the stand less favorable to infestation by beetles. Improved tree vigor could also reduce the risk of beetle attack; however, as mentioned previously, growth and vigor of the trees in the thinned lodgepole pine stands is not expected to improve substantially, due to the dense, stagnated conditions of the stands.

Although some of the stands at highest risk to windthrow were not included in Alternative 3, there still would likely be some windthrow of the residual trees in the thinned units in this alternative. Trees that have developed and grown for long periods in conditions of higher stand density tend to be less windfirm than those in conditions that are more open. Were the stand to be opened up, the support and shielding from the wind that had been provided by adjacent trees would be reduced, and the trees would be more susceptible to windthrow. Windthrow would be most pronounced in stands where shallow-rooted species (lodgepole pine, spruce, and subalpine fir) were dominant. Degree of loss due to windthrow would be hard to predict, and would depend not only on the species and density of trees left in the stand, but on the stand's location relative to prevailing winds. Chance also plays a role, as an unpredictable windstorm event could occur anywhere. Windthrow risk is moderate to high in nearly all of the proposed thinning units in Alternative 3, primarily because of the relatively small diameter lodgepole pine that would be left in most units. If most of the trees were blown down, the objective of providing adequate snow intercept would be negated. Downed trees would add to the downed-wood component, providing benefits to soils and wildlife. On an individual site basis, downed fuel loadings and associated future fire intensity would increase substantially should most of the trees blow down. However due to the scattered location and very small area actually treated across the landscape, this potential increase in downed fuels should not post a serious fire hazard (refer to Fire/Fuels section of this document).

Most of the lodgepole pine would be removed in the regeneration harvest units, and the risk of windthrow in these units would be relatively low. The remaining overstory trees would be larch and Douglas-fir, which tend to be more windfirm than lodgepole pine. These residual trees would be left at a low density so if they were to blow down, there would be too few to cause fire hazard or planting concerns.

Travel Management Effects to Timber Management

Travel management effects for Alternative 3 would be the same as for Alternative 2.

Alternatives 2 & 3 (Action Alternatives)

Cumulative Effects

Forest Conditions

The desired condition over time would be to maintain or create forest conditions within the Firefighter Project area that could occur under natural disturbance and succession regimes. Managing within the range of historic variability would more likely result in a healthy and sustainable ecosystem, one that would be more resilient to inevitable change and able to provide greater flexibility for future management choices.

Alternative 2 would create vegetation conditions that are within, or making progress towards achieving, the desired forest condition, and it would be managing within the range of historic variability. All treatments would remove lodgepole pine (mature and low vigor), would favor the retention of larch and Douglas-fir (immature, high vigor, long-lived, larch is more insect/disease resistant), and would be treating stands in a mid-successional stage of development (except for sapling stand in Unit 70), converting them to an early successional stage. This would increase the proportion of early successional, seedling and sapling forest by about 716 acres, and decrease the overabundant mid-successional forest by the same amount. Overall, this would affect a very small proportion of the landscape, with the regeneration harvest areas comprising only 5% of the total Firefighter Project area.

Of the estimated 3,600 acres of mature lodgepole pine stands in the project area, Alternative 2 would treat about 377 acres, or 10%, a relatively small portion of the total, but another small step towards achieving desired conditions. Of the estimated 8,800 acres of mixed-species, 70-80-year-old forest, Alternative 2 would treat about 364 acres, or 4%, also a very small portion of the total. This low amount of mixed-species forest occurs mostly because these types of stands are of low priority for treatment; many are already in a desirable condition regarding species diversity, vigor, and health. The treatments in these mixed-species stands would focus only on the removal of lodgepole pine.

Alternative 3 proposes to treat approximately half the acreage compared to Alternative 2 (355 acres compared to 749 acres) with much less regeneration harvest (180 acres compared to 716 acres). Thus, the change in conditions across the landscape described in the previous paragraph would be far less noticeable or consequential. Alternative 3 would result in a barely measurable 1% change in species composition, stand structure, and successional stages across the project

area. Alternative 3 would treat 174 acres, or 5%, of the total acreage of mature lodgepole pine; and 173 acres, or 2%, of the 70-80-year-old mixed-species stands.

Within the areas designated as elk/mule deer winter ranges in the Forest Plan, Alternative 2 would convert about 416 acres in the Firefighter Mountain Winter Range area and 120 acres in the Mount Murray Winter Range area from currently densely stocked forest into early successional shrub and conifer sapling-dominated openings. When combined with the previous regeneration harvesting in these areas since the 1950s, this results in a total of about 1,130 acres of regeneration harvesting/opening creation in the Firefighter Mountain Winter Range and about 350 acres in the Mount Murray Winter Range. This is about 25% and 22% respectively of the total designated winter range areas. Refer to the Wildlife section of this document for further discussion of this effect.

Alternative 2 would better promote ecosystem objectives by prescribed burning the post-harvest slash in designated elk winter range units. This treatment would more closely emulate natural processes than would the mechanized treatment of slash (i.e. excavator piling and burning) under Alternative 3. Alternative 3 would have prescribed burning only on Unit 40 (7 acres), which would be on a steep slope; all other units would have slash treated by mechanical means. Although mechanized slash treatment would not compromise ecosystem processes, it would not provide the same ecological benefits that burning would.

Individual stand treatments under both Alternatives 2 and 3 would retain the important ecological components of large diameter, older trees (i.e. >18” dbh live Douglas-fir and western larch) and large snags (>16” dbh) whenever possible.

Natural succession would continue within all treated areas, causing gradual but predictable changes in forest structure, size, and age classes over time. Natural succession would also continue in the majority of acres in the project area that remain untreated by this project. This would include about 12,000 acres of 70 to 100-year-old forest, 2,700 acres of sapling forest, and 300 acres of late-successional forest. A variety of forest structures, species, snag components, down-wood levels, and other conditions exist in this area, providing for a diversity of resource needs, including wildlife cover and the development of future old-growth forest.

Global Warming

Forests and forest management play an important role in carbon sequestration, and indirectly, in global warming. Forests can help mitigate the effects of greenhouse gas emissions by removing carbon from the atmosphere and sequestering it in biomass. The impacts of the Action Alternatives on global carbon sequestration and atmospheric concentrations of CO_2 are miniscule, due to the small number of acres that would be affected by this project. However, the forests of the United States significantly reduce atmospheric concentrations of CO_2 resulting from fossil fuel emissions. This rate of carbon sequestration offsets approximately 10%-30% of CO_2 emissions from burning fossil fuels. The short-term reduction in carbon stocks and sequestration rates resulting from the proposed project are imperceptibly small on global and national scales. For more information, refer to the Global Warming Analysis in the Miscellaneous section of the Project File.

Regulatory Framework and Consistency

The National Forest Management Act of 1976 (NFMA) has provisions that pertain to vegetation management on National Forest lands. These provisions address a wide range of vegetation management, including the consideration and protection of other resources (e.g. soils, water, wildlife) when managing vegetation; the appropriateness of even-aged management systems and adequate site reforestation following such harvests; and the proper consideration of the economic aspects of the project. These provisions, and others, are described in the Forest Service Manual at 1921.12. The proposed project activities have been determined to fully comply with these requirements.

Flathead National Forest Land and Resource Management Plan (Forest Plan) goals include maintaining a diversity of vegetation and habitats across the forest to meet the needs of a variety of wildlife species, and to provide for a sustained yield of timber products (Forest Plan, p. II-5). Amendment 21 to the Forest Plan has updated and modified some of the goals, objectives, standards, and guidelines regarding vegetation management on the Flathead National Forest, particularly regarding old-growth forest. The Forest Plan further defines timber management goals of providing a sustained yield of timber products that is cost effective, responsive to the needs of the local economy, and is consistent with other Forest management goals (Forest Plan, p. II-5). These goals are discussed in Forest-wide timber management objectives described on pages II-7 to II-9 of the Forest Plan.

All alternatives meet the goals, objectives, and standards of the Forest Plan for the Management Areas affected.

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